



PALEONTOLOGICAL RESOURCES:

THRESHOLDS OF SIGNIFICANCE and PROJECT SCREENING CRITERIA

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SUMMARY AND THRESHOLDS

Paleontological resources (i.e. fossils) are the remains and/or traces of prehistoric organisms preserved in geological formation from a past epoch. Paleontological resources are critical evidence in determining the climatic, geomorphic, and geologic changes that have occurred over time. Unmonitored excavation of geological formations that potentially contain paleontological resources can result in the permanent loss of this information.

The type of rock (i.e, igneous, metamorphic or sedimentary) and the depositional environment (e.g., marine, lagoonal, riverine) under which a geologic formation was created dictates whether paleontological resources will be present as well as their type, variety, and density. Based on these criteria, and information on previously recorded fossil finds, geologic formations were characterized as having either High, Moderate, Marginal, Low or Zero paleontological resource potential (Demere and Walsh, 1994). A summary table of the geological formations that occur in San Diego County and their paleontological resource potential is included in Table 1 - Paleontological Resource Potential Ratings (attached).

The probability of discovering paleontological resources depends on the geologic formation being excavated and the depth and volume of the excavation. Normal weathering processes (leaching, rodent activity, rooting disturbance) generally compromise paleontological resources in the top several feet of geological formations. Furthermore, paleontological resources usually occur randomly throughout geologic formation. The probability of actually excavating a fossil is directly proportional to the Resource Potential Rating of each geological formation.

Therefore, projects will be determined to have a potentially significant adverse environmental effect related to as follows:

1. In areas underlain by geologic formations designated as "High Resource Potential" as listed in Table 1 - *Paleontological Resource Potential Ratings* (attached), if any of the following criteria are met:

- a) The total excavation associated with the project exceeds 1,000 cubic yards and any portion of such excavation exceeds ten feet in depth into the geologic formation; or
 - b) In situations where the geologic formation has been previously excavated and the total excavation associated with the project exceeds 1,000 cubic yards; or
 - c) In situations where projects are located within 100 feet of a recorded fossil site and is within the same geologic formation as such site.
2. In areas underlain by geologic formations designated as “Moderate or Marginal Resource Potential” as listed in Table 1 - Paleontological Resource Potential Ratings (attached), if any of the following criteria are met:
 - a) The total excavation associated with the project exceeds 2,000 cubic yards and any portion of such excavation exceeds ten feet in depth into the geologic formation; or
 - b) In situations where the geologic formation has been previously excavated and the total excavation associated with the project exceeds 2,000 cubic yards; or
 - c) In situations where projects are located within 200 feet of a recorded fossil site and is within the same geologic formation as such site.
3. In areas underlain by geologic formations designated as “Low Resource Potential” as listed in Table 1 - *Paleontological Resource Potential Ratings* (attached), if any of the following criteria are met:
 - a) The total excavation associated with the project exceeds 3,000 cubic yards and any portion of such excavation exceeds ten feet in depth into the geologic formation; or
 - b) In situations where the geologic formation has been previously excavated and the total excavation associated with the project exceeds 3,000 cubic yards; or
 - c) In situations where projects are located within 200 feet of a recorded fossil site and is within the same geologic formation as such site.
4. In areas underlain by geologic formations designated as “Zero Resource Potential” as listed in Table 1 - *Paleontological Resource Potential Ratings* (attached) there is no potential for adverse effects to paleontological resources.

Projects that integrate standard mitigation including required monitoring, recovery, preparation, curation, and storage as specified in the “Standard Mitigation Criteria” section, below, shall be considered to be mitigated to a level below significance.

1.0 GENERAL PRINCIPLES

Paleontological resources (i.e., fossils) are the remains and/or traces prehistoric (10,000 years and older) plant and animal life. Fossil remains such as bones, teeth, shells, and wood are found in the rocks and sediments within which they were originally buried. Individual paleontological resources (fossils) are considered to be important if they are: 1) well preserved; 2) identifiable; 3) type/topotypic specimens; 4) age diagnostic; 5) useful in paleoenvironmental and paleoecological reconstructions, and 6) represent new, rare, and/or endemic taxa.

For the purposes of land planning, paleontological resources can be thought of as including not only the actual fossil remains, but also the collecting localities, and the geologic formations containing those localities. Because there is a direct relationship between fossils and the geologic formations within which they are entombed, knowledge of the geology of a particular area and the paleontological resource sensitivity (i.e., fossil productivity) of particular rock formations make it possible to predict where fossils will (or will not) be found. As a result, a general overview of the geologic setting of San Diego County provides a foundation for evaluating the paleontological resources within the region.

San Diego County is underlain by a number of distinct geologic rock units (i.e., formations) that record portions of the past 450 million years of Earth history. However, the record is most complete for only the past 75 million years. These local rocks and their contained biological record (i.e., fossils) document the geological and biological evolution of this part of western North America and help scientists and educators better understand the climatic, geomorphic, and geologic changes that have occurred. Deciphering this geological and biological history is an ongoing process and each year brings new discoveries. This is especially the case in San Diego County, where continued growth and development create more and more impacts to our local paleontological resources.

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Geologic deposits with zero to low paleontological resource sensitivity characterize the majority of the unincorporated areas of San Diego County. Areas of high and moderate sensitivity are found in the north western (Camp Pendleton), west central (La Jolla Valley), north central (Warner Valley), north eastern (Anza Borrego Desert), east central (Coyote Mountains, and south eastern (Jacumba Valley) areas of the County.

Table 1.0 Paleontological Resource Potential Ratings lists the existing formations in San Diego County that are known to contain paleontological resources and breaks each formation down by its resource potential.

The following levels of sensitivity are rated for individual geologic formations (see Table 1.0):

- A. High resource potential** is assigned to geologic formations known to contain paleontological localities with rare, well-preserved, critical fossil materials for stratigraphic or paleoenvironmental interpretation, and fossils providing important information about the paleobiology and evolutionary history of animal and plant groups. In general, highly sensitive formations are considered to have the potential to produce vertebrate fossil remains.
- B. Moderate resource potential** is assigned to geologic formations known to contain paleontological localities with poorly preserved, elsewhere common, or stratigraphically unimportant fossil material. The moderate sensitivity category is also applied to geologic formations that are judged to have a strong, but unproven potential for producing important fossil remains.
- C. Marginal resource potential** is assigned to geologic formations that are composed either of volcanic rocks or high-grade metasedimentary rocks, but which nevertheless have a limited probability for producing fossil remains from certain sedimentary lithologies at localized outcrops.
- D. Low resource potential** is assigned to geologic formations that, based on their relative young age and/or high-energy depositional history, are judged unlikely to produce important fossil remains. Typically, low sensitivity formations produce invertebrate fossil remains in low abundance.
- E. Zero resource potential** is assigned to geologic formations that are entirely plutonic igneous rock and therefore have no potential for producing fossil remains.

2.0 EXISTING REGULATIONS

In California, adverse impacts to such resources (i.e. paleontological) are addressed within the California Environmental Quality Act (CEQA), specifically identified in Appendix G, Item V(c) of the State CEQA Guidelines includes the following:

“Would the [proposed] project directly or indirectly destroy a unique paleontological resource?”

However, while the CEQA analysis includes paleontological resources, no formal operative regulatory laws or ordinances have been developed at the local, state or federal level for the preservation or protection of paleontological resources.

3.0 RATIONALE FOR THRESHOLDS OF SIGNIFICANCE FOR PALEONTOLOGICAL RESOURCES

Unmonitored excavation of geological formations that potentially contain paleontological resources can result in the permanent loss of this information. The five categories listed on the *San Diego County Paleontological Potential* map summarized in Table 1.0 *Paleontological Resource Potential Ratings*, and described in Section 2.0, combine available data on San Diego County’s geologic formations with information on paleontological resource potential. The volume of grading referred to in the thresholds of significance was selected based on standard excavation amounts for pipeline construction and for single-family home construction, as well as discussions by staff from both the City and County of San Diego and the San Diego Natural History Museum. The minimum graded cut depth of ten feet is the approximate depth below which bedrock is unweathered. The volume thresholds are an attempt to address the patchy nature of many fossil occurrences and the observation that fossil discoveries increase in frequency with increasing volume of excavation. The figure of 1000 cy is taken as a minimum threshold as it reflects an excavation with 10’ x 10’ footprint and a 10’ depth.

4.0 SCREENING CRITERIA

The County of San Diego has developed specific screening criteria to allow staff to be able to quickly determine the potential of paleontological resources on each of the County’s parcel. To complete this, staff has integrated the information in Table 1.0 *Paleontological Resource Potential Ratings* with the paleontological information found in the Department of Planning and Land Use’s GIS Mapping Application in order to develop the *San Diego County Paleontological Resource Potential Map*, shown as an attachment. In addition, Table 1.0 *Paleontological Resource Potential Ratings* should be used to screen projects for paleontological sensitivity while reviewing the proposed project’s conceptual or actual grading plan. If a site-specific Geotechnical report is available, it should be reviewed concurrently with the map, and then compared with the information found in Table 1.0.

5.0 STANDARD MITIGATION CRITERIA

The primary goal of paleontological mitigation programs is the recovery, curation, and permanent storage of significant fossil remains, thus preserving what would otherwise have been destroyed and lost due to excavation activities.

A number of standard mitigation measures shall be required when: the *San Diego County Paleontological Resource Potential* map indicates that a proposed project is in an area that is likely to contain important fossil remains, and the thresholds of significance for paleontological sensitivity are relevant and verified by a qualified person. The mitigation measures listed below are considered by the County of San Diego to clearly mitigate environmental impacts to a level below significance:

Prior to Issuance of any Grading Plan:

- a. The applicant shall retain a qualified paleontologist to supervise and implement the mitigation elements outlined below. A qualified Paleontologist is a person with a Ph.D. or M.S. in paleontology or a closely related field (e.g. geology or paleobiology), who has a proven knowledge of San Diego County paleontology and geology, and who has documented experience in professional paleontological procedures and techniques. The applicant shall provide evidence of contracting with a paleontologist through a letter signed by the paleontologist that states the applicant has retained him. The paleontologist shall attend all pre-grading meetings to consult with grading contractors;
- b. The applicant shall cause to be placed on the face of the grading plan as conditions of approval the following:
 - 1) A qualified paleontological monitor shall be present on-site during all excavation operations within formations that may contain paleontological resources. A qualified paleontological monitor is defined as an individual with proven experience in the discovery and collection of fossil materials. The paleontological monitor shall work under the direct supervision of the qualified paleontologist. The paleontological monitor shall have the authority to direct, divert, or halt any grading activity.
 - 2) If paleontological resources are unearthed the paleontologist or paleontological monitor shall:
 - i. Direct, divert, or halt any grading activity until such time that the sensitivity of the resource can be determined and the appropriate mitigation implemented; and
 - ii. Salvage unearthed fossil remains, including simple excavation of the exposed specimen but possibly also plaster-jacketing of large and/or fragile specimens, or more elaborate quarry excavations of richly fossiliferous deposits; and
 - iii. Recover of stratigraphic and geologic data to provide a context for the recovered fossil remains, typically including description of lithologies of fossil-bearing strata, measurement and description of the overall stratigraphic section, and photographic documentation of the geologic setting; and

- iv. Laboratory prepare (cleaning and repair to the point of curation) collected fossil remains, including removal of enclosing rock material, stabilization of fragile specimens (using glues and other hardeners), and repair of broken specimens; and
 - v. Catalog and identify prepared fossil remains, including scientific identification of specimens, inventory of specimens, assignment of catalog numbers, and entry of data into an inventory database; and
 - vi. Transfer, for storage, cataloged fossil remains to an accredited institution (museum or university) that maintains paleontological collections, including the fossil specimens, copies of all field notes, maps, stratigraphic section and photographs; and
- 3) The paleontologist shall prepare a final report summarizing the field and laboratory methods used, the stratigraphic units inspected, the types of fossils recovered, and the significance of the curated collection; and
- 4) Prior to the sign-off of final grading or improvement plans by the County of San Diego, the applicant shall furnish documentary evidence of the satisfaction of conditions 2 and 3, above and cause the Director of Planning and Land Use to acknowledge in writing that said conditions, have been complied with.

6.0 LIST OF REFERENCES

California Environmental Quality Act, CEQA Guidelines, 1999.

City of San Diego. (revised) August 1998. *Paleontological Guidelines*.

Demere, Thomas A., and Stephen L. Walsh. 1994. *Paleontological Resources San Diego County*. Department of Paleontology, San Diego Natural History Museum.

Demere, Thomas A. June 24, 1994. Personal Communication. San Diego Natural History Museum.

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Moore, Ellen J. 1968. Fossil Mollusks of San Diego County. San Diego Society of Natural history. Occasional; Paper 15.

TABLE 1.0 - Paleontological Resource Potential Ratings

Geologic Unit	Potential Fossil Localities in Unincorporated Area	Resource Potential Rating
Alluvial deposits of mountain valleys	Peninsula Range	Low
Alverson Volcanics	Anza Borrego	Moderate
Ardath Shale	Rancho Santa Fe	High
Bay Point Formation	Camp Pendleton	High
Borrego Formation	Anza Borrego Desert	High
Brawley Formation	Anza Borrego	Moderate
Canebrake Conglomerate	Anza Borrego	Moderate
Capistrano Formation	Camp Pendleton	High
Delmar Formation	Rancho Santa Fe	High
Friars Formation	Rancho Santa Fe	High
Imperial Formation	Anza Borrego Desert	High
Later Quaternary alluvial fan deposits	Peninsular Range/Anza Borrego	Low
Later Quaternary alluvium	Sweetwater River Valley, Rancho Santa Fe	Low
Lusardi Formation	Rancho Santa Fe	Moderate
Mission Valley Formation	Sweetwater River Valley & Otay Mesa	High
Ocotillo Conglomerate	Anza Borrego Desert	High
Older metasedimentary rocks	Peninsular Range	Marginal
Older Quaternary alluvial fan deposits	Pala, Warner Valley	Moderate
Otay Formation	Sweetwater River Valley & Otay Mesa	High
Palm Spring Formation	Anza Borrego Desert	High
Pauba Formation	Warner Valley	Moderate
Peninsular Ranges Batholith	Peninsular Range	Zero
Point Loma Formation	Rancho Santa Fe	High
San Diego Formation	Sweetwater River Valley	High
San Mateo Formation	Camp Pendleton	High
San Onofre Breccia	Camp Pendleton	Moderate
Santiago Formation, member "A"	Camp Pendleton	Moderate
Santiago Formation, member "B"	Camp Pendleton	High
Santiago Formation, member "C"	Camp Pendleton	High
Santiago Peak Volcanics	Peninsular Range	Marginal
Split Mountain Formation	Anza Borrego	Moderate
Friars Formation	Rancho Santa Fe	High
Stadium Conglomerate, lower member	Rancho Santa Fe	High
Stadium Conglomerate, upper member	Rancho Santa Fe	Moderate
Sweetwater Formation	Sweetwater River Valley & Otay Mesa	High
Table Mountain Gravels	Jacumba Valley	High
Temecula Arkose	Warner Valley	High
Torrey Sandstone	Rancho Santa Fe	Moderate
Unnamed marine terrace deposits	Camp Pendleton	Moderate
Unnamed river terrace deposits	Sweetwater River Valley/Rancho Santa Fe/Camp Pendleton	Moderate

Source: Demere, Thomas A., and Stephen L. Walsh. 1994. *Paleontological Resources San Diego County*. Department of Paleontology, San Diego Natural History Museum.